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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,417	10/03/2003	Chun Ho Fan	50626.58	1001
35510	7590	04/19/2005		
KEATING & BENNETT, LLP 10400 EATON PLACE SUITE 312 FAIRFAX, VA 22030			EXAMINER TRINH, MICHAEL MANH	
			ART UNIT 2822	PAPER NUMBER

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/678,417

Applicant(s)

FAN ET AL.

Examiner

Michael Trinh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 February 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12 and 14-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12 and 14-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

*** This office action is in response to Applicant's amendment filed on February 07, 2005.

Claims 1-11,13, and 20 were canceled. Claims 12 and 14-19 are currently pending.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

1. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III (5,583,377) taken with Suzuki (6,028,358).

Higgins teaches (at Figs 1-8; cols 2-8) a method for fabricating an integrated circuit package comprising at least the steps of: providing a substrate having opposite first and second surfaces and conductive traces 18,14 extending therebetween, the substrate having a cavity therein; fixing a heat sink slug in form of a plate (e.g. 66/68 in Fig 3) to the first surface of the substrate 62 such that the heat slug spans 66/68 the opening cavity 20 (e.g. Figs 3, col 5, lines 44 through col 6; col 2, line 50 through col 3, line 42), wherein the base portion of heat sink slug preferably extends below circuitized substrate; however, the base portion can be planar with the circuitized substrate (col 6, lines 60-68; lines 7-68; col 8,lines 49-51); mounting a semiconductor die 13 to said heat slug 66, at least a portion of said semiconductor die 13 being disposed in said cavity 20; wire bonding 19 said semiconductor die 13 to ones of the conductive traces 14/18 at the second surface of the substrate 62 (Figs 3,2,1, col 3, line 11 through col 5); encapsulating said wire bonds 19 and said semiconductor die 13 in an encapsulating material 33 (col 4, lines 35-42), and forming a ball grid array 21 on a first surface of said substrate 62 such that bumps 21 of said ball grid array are in electrical connection with ones of said conductive traces 14 (col 3, lines 30-42). Re claim 13, wherein fixing said heat sink slug to said substrate comprises fixing said heat sink slug 66/68 to said first surface of said substrate 62 (Fig 3; col 5, lines 44-67; col 2, lines 50 through col 3, line 42; col 4).

Higgins already teaches spanning the opening cavity 20 with a heating slug in the form of a plate having the base portion of heat sink plug preferably extending below circuitized substrate but the base portion can be planarized with the circuitized substrate (col 6, lines 60-68; 7-68; and col 8,lines 49-51).

Higgins thus lacks showing the heat slug in the form of a substantially flat plate.

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However, Suzuki teaches and shows at Figure 1A (first embodiment, col 3, line 55 through col 4) spanning the opening cavity with a heating slug 4 in the form of a plate having the base portion of heat sink plug extending below circuitized substrate, and also teaches and show at Figure 3 (second embodiment; col 5, lines 39-55; Figs 7-8; col 6, line 45 through col 7) spanning the opening cavity with a heating slug 13 in the form of a substantially flat plate.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to fixing the heat slug in the form of the plate of Higgins to the substrate by alternatively employing the heat slug in the form of a substantially flat plate as shown and prima facie taught by Suzuki. This is because these heat slugs are alternative and art recognized equivalent for substitution, wherein a semiconductor device package having the flat heat slug is planar, and wherein a plurality of semiconductor device packages having the flat heat slugs can be effectively stacked together so as to form stacked devices.

2. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III (5,583,377) and Suzuki (6,028,358), as applied to claim 12, and further of Li (5,982,621).

Higgins and Suzuki teach (at Figs 1-8; cols 2-8) a method for fabricating an integrated circuit package as applied to claim 12 above.

Higgins teaches fixing the heat slug 66/68 to the substrate by adhesive, but lacks fixing by a solder reflow technique.

However, Jamieson et al teach (at Figs 2-4; col 2, lines 37-61) fixing a heat slug 30 of metal to a board substrate 32 by solder reflowing technique or adhesive.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to fixing the heat slug of Higgins to the substrate by employing a solder reflowing technique as taught by Jamieson, because soldering and adhesive fixing techniques are alternative and art recognized equivalent techniques for substitution in fixing the metal heat slug to the substrate so that the heat slug can be firmly and strongly attached to the substrate in a reliable manner.

3. Claims 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins, III (5,583,377) and Suzuki (6,028,358), as applied to claim 12, and further of Li (5,982,621).

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Higgins and Suzuki teach (at Figs 1-8; cols 2-8) a method for fabricating an integrated circuit package as applied to claim 12 above.

Prior to encapsulating, Higgins lacks mounting a die adapter to the semiconductor die (as recited in claims 15-16), mounting a heat spreader to the substrate (as recited in claims 17-18), and mounting a heat spreader such that at least one side wall of the heat spreader is mounted to the substrate and a top portion of the heat spreader contacts the adapter (as recited in claim 19).

However, prior to encapsulating of an encapsulating material 40, Li teaches (at Figs 4-6,2; col 2, line 31 through col 3, line 7): Re claim 15, mounting a die adapter 20 to a semiconductor die 31; Re claim 16, wherein encapsulating comprises encapsulating the wire bonds 32 and the semiconductor die 31 and surrounding the die adapter 20 such that a surface of said die adapter 20 is exposed (Figs 4-6; col 2, lines 31 through col 2, line 7); Re claims 17-18, mounting a heat spreader 10 to the substrate 30 (Figs 4,1-2; col 2, lines 12-31; abstract); and Re claim 19, mounting a heat spreader, prior to encapsulating, such that at least one side wall of said heat spreader 10 is mounted to said substrate 30 and a top portion of said heat spreader contacts said die adapter 20.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to fabricate the integrated circuit package of Higgins by, prior to encapsulating, mounting the die adapter to the semiconductor die and the heat spreader to the substrate such that at least one side wall of said heat spreader is mounted to the substrate and a top portion of the heat spreader contacts the die adapter, as taught by Li. This is because of the desirability to quickly cool the die during operation by dissipating the heat from the chip through the die adapter and the heat spreader, thereby improving the reliability and working efficiency of the integrated circuit package.

Response to Arguments

*** Applicant's arguments filed February 07, 2005 have been fully considered but they are not persuasive, and also moot in view of the new ground(s) of rejection.

Regarding Applicant's remarks about the heat slug in the form of a substantially flat plate, Higgins teaches (at Fig 3) fixing a heat sink slug 66/68 in form of a plate to the first surface of the substrate 62 such that the heat slug spans 66/68 the opening cavity 20, wherein

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the base portion of heat sink slug preferably extends below circuitized substrate; however, many benefits are achieved if the base portion is planar with the circuitized substrate (col 6, lines 60-68; lines 7-68; col 8, lines 49-51).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F from 8:30 Am to 4:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.
Oacs-3-9



Michael Trinh
Primary Examiner